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Joseph Schumpeter's vision of competition saw it as a destructive process in which effort, assets and fortunes were continuously destroyed by innovation. This endless process displaced older technologies in order to make way for new ones, but led to economic growth far greater than more stable, conservative alternatives.[1] Schumpeter's vision was striking, in sharp contrast with the conventional neoclassical model of competitive markets, where the focus was on changes in output and price, relatively leisurely shifts in consumer tastes, and exceptional strategic behavior that occasionally dislodged one technology and displaced it by another. Neoclassical competition is a little like watching the ocean when it is calm, while Schumpeterian competition is like watching a raging storm or perhaps even a tidal wave.

As Evans and Hylton so powerfully observe, neoclassical economics is much more comfortable modeling the relatively stable situation than the Schumpeterian one.[2] Economists since Alfred Marshall have observed that the static, partial equilibrium analysis that dominates industrial economics is readily susceptible to mathematics, and many of its rather specific propositions are testable[3] The Schumpeter model may be testable at a very general level, but probably not in any sense that antitrust policy finds useful. Schumpeter's analysis is much too concerned with the mostly unmanageable realities of the economy as a whole and with largely unanticipated developments that cannot readily by modeled within

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[1] Most famously in Joseph A. Schumpeter, Capitalism, Socialism and Democracy (1942), particularly chapter 7, on "The Process of Creative Destruction." Some of his argument was anticipated in Joseph A. Schumpeter, The Theory of Economic Development (1912).

[2] David S. Evans & Keith N. Hylton, "The Lawful Acquisition and Exercise of Monopoly Power and its Implications for the Objectives of Antitrust." Competition Policy, Autumn 2008.

[3] On this point, see Joseph A. Schumpeter, History of Economic Analysis 835-838 (1954; revised ed, 1984). See also Herbert Hovenkamp, The Neoclassical Crisis in U.S. Competition Policy, 1890-1955 (SSRN working paper, July, 2008, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1156927).

the equilibrium-searching forces of neoclassical economics.

To be sure, at a fairly general level the contributions that innovation makes to economic growth can be modeled, and to an extent the models can be empirically tested. For example, the neoclassical growth model developed by Robert W. Solow in the 1950s assumed that innovation is an exogenous factor in the economy, and one can test for its presence and magnitude by assessing the impact of endogenous factors and then assuming that the "residual," or the amount by which growth exceeds these expectations, must be the result of innovation.[4] For example, it leads to the testable hypothesis that relatively undeveloped economies will grow more quickly than developed ones because the former can borrow innovations from the more developed, while the latter must develop them internally. By contrast, endogenous growth models tend to see innovation as growing out of variables that are within the model of the economy.[5]

Today Schumpeter's conclusion that innovation results much more from convulsive, unexpected changes than from the gradual movement of a market toward competitive equilibrium is fairly well established. What we cannot do, however, is *ex ante* measurement of the long run effects of *specific* innovation efforts. Nor can we predict the long run impact of some observed practice on innovation, certainly not in marginal cases. While innovation overall creates an enormous payoff to society, predicting successful innovations on a case-by-case basis is a fool's errand. Testing like that done of Solow's neoclassical growth model is entirely *ex post*, looking back at the impact of previous innovation in a defined place and time period. Further, it measures aggregate productivity only.

A very high percentage of innovation programs fail, but the ones that succeed frequently provide enormous payoffs. And of course the problem is that *ex ante* separation is impossible. If we could predict successful innovations accurately then we could avoid

[4]Robert M. Solow, A Contribution to the Theory of Economic Growth, 70 Q.J.Econ. 65 (1956); Robert M. Solow, Technical Change and the Aggregate production Function, 3 Rev. Econ. Statistics 312 (1957).

[5] See Paul M. Romer, The Origins of Endogenous Growth, 8 J. Econ. Persp. 3 (1994).

launching the unsuccessful ventures and save enormous resources. These problems have proven to be significant obstacles for economic analysis of specific antitrust claims where the question is likely effects on innovation in the future.

Another problem with measuring innovation or its impact from an *ex ante* perspective is that innovation is so badly behaved in comparison with the ordinary price and output functions of neoclassical economics. Most changes in price and output are continuous and related to one another. We know enough about many types of practices (price fixing, predatory pricing, mergers, etc) to predict price and output effects. But the consequences of innovation are often radically indeterminate – sometimes rewarding a large investment by producing nothing at all, or sometimes by producing results that were far different than anyone anticipated.[6] The classic example is Viagra, which was the result of a project seeking treatments for angina. Protracted male erections were initially regarded by the researchers as an undesirable side effect of what would later become one of the most successful pharmaceuticals ever.[7]

As Evans and Hylton observe, in antitrust economic analysis we tend to look at the price and output effects of practices. We evaluate them by asking whether they tend toward increased or decreased output, higher or lower prices, or whether they injure consumers over a testable time period, which is typically quite short. We do not try to show more, because for the most part we cannot answer second order questions about long run welfare implications. In the short run a practice may destroy a rival, produce monopoly, and may even appear to impair consumer welfare. But in the longer run it may be part of the very process of creative destruction that Schumpeter believed to be the bedrock of economic progress. Or to say it differently, it may be quite easy for an antitrust economist to predict that a particular exclusionary practice will tend to produce lower marketwide output and higher prices. But it is very likely impossible to predict whether some inchoate innovation that is part

[6] Herbert Hovenkamp, Restraints on Innovation, 29 Cardozo L.Rev. 247 (2007).

[7] See id. at 256-257; and Ian H. Osterloh, *The Discovery and Development of Viagra (sildenafil citrate) in* Sildenafil 1, 3 (U. Duzendorfer, ed. Burkhäuser Verlag 2004).

of the monopolist's scheme might produce long term gains that greatly outweigh these short term losses.

That argument is difficult to dispute, but it is subject to several limitations that serve to dilute its importance. Indeed, the observation may do little more than act as a warning that antitrust economics, and more importantly federal judges, must keep one wandering eye on the long run. Here are the qualifiers I would add:

1. We should not confuse the prospect of innovation with the scope of the intellectual property laws;

2. For many practices positive innovation effects are difficult to foresee even on Schumpeter's own expansive and nonmathematical terms;

3. Many antitrust violations restrain rather than promote innovation.

On these points.

First, one must never confuse the prospect of innovation with the scope of the intellectual property laws. While Evans and Hylton are speaking generally about competition and innovation as complementary rather than competing products, they refer to this principle by suggesting that there is "no fundamental tension between the policies of antitrust law and intellectual property law; both balance the benefits and costs of static and dynamic competition for the economy as a whole."[8] While that might be true of an economy with ideal competition law and intellectual property law systems, it is hardly true of the world that we actually live in. In fact, both the Patent Act and the Copyright Act have produced bloated regulatory regimes that probably serve to undermine innovation as often as they promote it, and almost certainly do more damage to the innovation process than the antitrust laws themselves do. Indeed, there is reason to believe that the patent system fails to carry its freight in any market except perhaps chemicals and pharmaceuticals;[9] and the copyright system has become a

[8]Evans and Hylton, "Lawful Acquisition," note 2 at 3.

[9] James Bessen and Michael J. Meurer, Patent Failure: How Judges, Bureaucrats, and Lawyers put Innovators at Risk (2008); and Robert P. Merges,

playground for special interest groups.[10]

Of course, federal judges are not at liberty to rewrite the detailed patent and copyright codes simply because they believe them to be badly designed. But the fact is that one cannot infer that if a conflict appears between competition policy and IP, siding with the latter is more conducive to further innovation. Further, as noted below, the antitrust laws may do a better job of furthering innovation than IP does, provided that it is sufficiently sensitive to the problem of innovation restraints.

The fact is that in the legal situation we face currently we can probably do far more to promote innovation by reformulating IP policy than by reformulating antitrust policy. For example, a more serious proof of harm requirement could go a long way, perhaps more in copyright than in patent. If an infringement benefits the infringer and its customers and causes no harm to the IP holder then it is a Pareto improvement. Injury should be measured in terms of the *ex ante* incentive to create the protected work in the first place.[11]

My second point is that for many practices challenged by the antitrust laws innovation effects are difficult to assess or even foresee on Schumpeter's own nonmathematical terms. Not every antitrust violation has significant implications for innovation. Pricing practices are a good example. When properly defined, both price fixing and predatory pricing involve changing the price of a good in anticompetitive ways. Neither one has obvious implications for innovation subject to one exception: one can always argue that a firm will use monopoly profits to innovate more, and that the gains from the resulting innovation might possibly far exceed the losses from short-run consumer injuries. But this argument proves too much and justifies monopoly no matter how created or maintained.

One Hundred Years of Solicitude: Intellectual Property Law, 1900-2000, 88 Cal. L. Rev. 2187, 2336 (2000). Even relative conservatives such as Landes and Posner find overprotection. See William M. Landes & Richard A. Posner, The Economic Structure of Intellectual Property Law, Ch. 1 (2003).

[10]Christina Bohannan, Reclaiming Copyright, 23 Cardozo Arts & Ent. L.J. 567, 568 (2006).

[11] See Christina Bohannan, Copyright Harm, Foreseeability and Fair Use, 85 Washington Univ. L.Rev. 969 (2007).

On the other hand, if a practice challenged under the antitrust laws actually furthers innovation, one would expect that the defendant could provide an explanation and some evidence of this. For example, if exclusive dealing really is being used to protect the market for an incipient product then the defendant should be able to tell us and this information should be incorporated into our rule of reason analysis.

Finally, the third point is that many antitrust violations restrain rather than promote innovation. Indeed there are good reasons for believing that market dominating firms or joint ventures with a significant investment in their technology are more likely to use exclusionary practices to restrain the innovations of rivals or potential rivals than to develop or promote their own innovations. For the most part, the technology and markets of dominant firms are well established and they tend to profit from stable growth. By contrast, the small firm seeking entry must shake up the pot.

Evans and Hylton give the very interesting example borrowed from the *Dentsply* case[12] of a firm that develops a new and innovative but unpatentable tooth. It must then use exclusive dealing in order to capitalize on its investment by excluding rivals via a restraint on market access rather than the IP laws.[13] Whether that story is plausible or not, there is an alternative story that is at least as plausible. Suppose that a smaller rival has developed an innovative artificial tooth that may very well be patentable, but success depends on market access. Further, this artificial tooth threatens to take a significant share of the market once it is successfully deployed. Dentsply's exclusive dealing serves to deny it market access.

In this case the antitrust violation has served to restrain rather than promote innovation. The story is more plausible than the Evans/Hylton story for two reasons. First, in this setting market shifting innovations are more likely to come from smaller firms. Once it has attained dominance a firm's interest in creative destruction

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[12] United States v. Dentsply Int'l, Inc., 399 F.3d 181 (3d Cir. 2005), cert. denied, 546 U.S. 1089 (2006) (condemning exclusive dealing as unlawful monopolization under §2 of the Sherman Act). See 3B Phillip E. Areeda & Herbert Hovenkamp, Antitrust Law ¶768 (3d Ed. 2008).

[13] Evans and Hylton, "Lawful Acquisition," note 2 at 40. [TAN 108].

becomes greatly diminished because it is as likely to be the victim as the enabler. Indeed, often a firm's investment in its own technology creates a form of path dependence. Its vested interests lie much more in preserving what it has rather than producing a huge market shifting innovation. Or it tends to innovate in ways that take advantage of technology and property rights in which it has already made an investment. By contrast, the smaller rival succeeds by differentiating its product from that of the dominant firm.[14] Second, exclusive dealing by a dominant firm is very likely a more effective means of excluding a smaller rival's innovation than it is of promoting the dominant firm's own innovation. Indeed, Evans and Hylton have to assume that the IP laws provide no protection in order to make their story work.

Finally, modeling the incentives to restrain innovation is at least potentially more tractable than modeling innovation itself, although measuring long run effects is often just as difficult. Restraints on innovation typically show up in creation or perpetuation of monopoly prices, reduced output, and the like. That is, a dominant firm typically restrains innovation in order to prevent its market position from eroding. Such gains to the monopolist are subject to the ordinary measurement tools of forensic economics.

The boycott situation is similar to the vertical exclusion story. Consider the *Allied Tube* case, which involved a boycott by the manufacturers of steel electrical conduit intended to exclude a market shifting innovation – conduit made from PVC.[15] PVC conduit was cheaper, easier to work with and did not short out when it came into contact with an electrical wire. Allied, whose manufacturing commitment was entirely to steel, plainly foresaw what later became a market reality: plastic conduit would swamp the field. It therefore organized a boycott designed to exclude plastic conduit from the market by writing its use out of municipal building codes.

The *Allied Tube* story is a particularly easy and obvious one,

[14] See, e.g., S.J. Liebowitz and S. E. Margolis, Path Dependence, Lock-in and History," 11 *J. L., Econ., and Org.* 205 (1995); J. Farrell and G. Saloner, Installed Base and Compatability: Innovation, Product preannouncements, and Predation, 76 Am.Econ.Rev. 940 (1986).

[15] Allied Tube & Conduit Corp. v. Indian Head, Inc., 486 U.S. 492, 496-497 (1988).

because PVC conduit was an innovation in its final stages of market preparation. Its market success was reasonably foreseeable by the time the antitrust violation occurred.[16] More incipient innovations are easier for dominant firms to exclude. Further, the violations are more difficult to detect, and it is certainly more difficult to prove injury. Consider the pressure that Microsoft placed on Intel to stop its Java-enabled chip R&D program lest Microsoft yank support for future editions of Windows.[17] Java is a multi-platform processing language. At the time the Java-enabled chip threatened to make alternative operating systems "compatible" with Microsoft Windows by enabling software developers to write software that would operate on multiple platforms and communicate seamlessly with one another. By excluding Java Microsoft stood to gain the higher market share and prices that resulted from suppressing innovative competition that threatened to make Windows one of many alternative platforms. Consumers lost uncertain value, depending on the likelihood that the chip would have succeeded and its market impact. Or consider the many, many cases involving *Walker Process* style patent infringement lawsuits based on improperly obtained patents or on irrationally broad patent claims.[18] Many of these are lawsuits brought by large firms with a heavy investment in their existing technology, designed to oust the innovative technology of a less well financed rival.

In sum, one place the antitrust laws could be more aggressive than they are today is when the stars are in alignment. An important corollary of the premise that innovation contributes much more to

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[16] For a similar story, see Am. Soc'y of Mech. Eng'rs v. Hydrolevel Corp., 456 U.S. 556 (1982), which involved an agreement among the members of an accreditation association to suppress a superior valve technology, with the result that the plaintiff's valve could not be marketed. See 13 Herbert Hovenkamp, Antitrust Law ¶2115 (2d ed. 2005).

[17] See Hovenkamp, Restraints on Innovation, note 6, 29 Cardozo L.Rev. at 249-250 (discussing United States v. Microsoft Corp., 84 F. Supp. 2d 9, 29 (D.D.C. 1999), aff'd in part, rev'd in part, but affirmed on this issue, United States v. Microsoft Corp., 253 F.3d 34 (D.C.Cir. 2001), cert. denied, 534 U.S. 952 (2001)).

[18] Walker Process Equip., Inc. v. Food Mach. & Chem. Corp., 382 U.S. 172 (1965). See 3 Phillip E. Areeda & Herbert Hovenkamp, Antitrust Law ¶706 (3d ed. 2008); Herbert Hovenkamp, The Walker Process Doctrine: Infringement Lawsuits as Antitrust Violations (SSRN working paper, Sep. 2008, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1259877).

economic growth than does price competition and short run efficiency, is that a *restraint* on innovation can do much more harm. Restraints such as the ones at issue in *Allied Tube* and *Microsoft* simultaneously produce higher prices in the dominant firm's market and loss of innovation in incipient markets that are delayed or not permitted to materialize.

The obvious question that raises is When is an antitrust violation more likely to be innovation enhancing rather than innovation restraining? While that question may be very difficult to answer in some cases, in others it appears not to be. For example, where a dominant firm is using an exclusionary practice to protect its established investment from an incipient technology harm to innovation seems the most likely outcome.

The most difficult set of cases is likely to involve joint ventures and at least some mergers, where the dangers of collusion must be set against the very real possibilities that the union will promote significant innovation. Standard setting is another area. The potential cost savings from reliable standards can be enormous, but the process can be used to exclude novel technologies. For example, the *Hydrolevel case* involved a situation where a standard setting committee within the American Society of Mechanical Engineers was manipulated into denying approval, and thus market access, to the plaintiff's innovative valve when the dominant firm perceived a market threat.[19]

It is also worth noting that restraints on innovation can be addressed under both antitrust policy and a properly formulated IP policy. For example, the doctrine of patent or copyright "misuse" can be a device for combating contractual devices or overly broad claims by IP holders that tend to restrain rival innovations. But misuse claims apply only against IP holders, and typically only in defenses against infringement lawsuits.[20] The restraints at issue in cases like

[19] Am. Soc'y of Mech. Eng'rs v. Hydrolevel Corp., 456 U.S. 556 (1982). See also Allied Tube & Conduit Corp. v. Indian Head, Inc., 486 U.S. 492, 496-497 (1988).

[20] See 10 Phillip E. Areeda, Einer Elhauge, and Herbert Hovenkamp ¶1781 (2d ed. 2004); Christina Bohannan, Intellectual Property Misuse and Foreclosure (2008).

Allied Tube and *Microsoft* did not involve firms acting as IP holders but rather as market participants with considerable leverage over others and existing technologies that they wished to protect.

An increased antitrust concern with restraints on innovation places a premium on government enforcement for the very reason that Evans and Hylton suggest: economic proof of the effects of restraints on innovation is so difficult to obtain, thus making proof of private injury and damages very difficult. A case in point is the tagalong litigation in *Kloth v. Microsoft,* where the Fourth Circuit ulimtately held that private plaintiffs could not obtain damages for Microsoft's suppression of Intel's Java chip program because they were too speculative. As the court observed, "It would be entirely speculative and beyond the competence of a judicial proceeding to create in hindsight a technological universe that never came into existence. . . ."[21] While private plaintiffs must show causation and actual injury for damages or threatened injury for an injunction, the United States or Federal Trade Commission acting as enforcer need show only that the antitrust laws have been violated.[22]

CONCLUSION

Schumpeter was correct that over the long run the gains from innovation dwarf the gains from government intervention to make the economy more competitive under the traditional criteria of price and output. It follows that the losses resulting from restraints on innovation could be very large as well. The problem of ex ante measurement of the social losses that result from a restraint on an undeveloped innovation are equivalent to the problem of ex ante measurement of the gains that the innovation would have produced had the innovation process been permitted to run its course. In both cases an ex ante assessment could be virtually impossible and in any case would be highly speculative.

But that does not necessarily mean that antitrust cannot do anything about the problem. In some cases, all that is necessary is to consider short run consequences for competition and ignore

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[21] Kloth v. Microsoft Corp., 444 F.3d 312, 323 (4th Cir. 2006); see Hovenkamp, Restraints on Innovation, note 6, 29 Cardozo L.Rev. at 259.

[22] See 2 & 2A Phillip E. Areeda & Herbert Hovenkamp, Antitrust Law ¶¶303, 326 (3d ed. 2007).

innovation possibilities that are too remote to see. In other cases one should consider whether an innovation or a restraint on innovation is the more likely outcome. The likelihood that a practice furthers innovation should serve to weaken or perhaps even undermine the antitrust concern. By contrast, the likelihood that a practice restrains innovation should deserve a much closer look.